SR TELECOM

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of	)	
	)	
Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies	)	ET Docket No. 92-9

To: The Commission

COMMENTS OF SR TELECOM, INC.

SR Telecom, Inc. (SR Telecom) submits herewith its comments in ET Docket No. 92-9, in response to the Federal Communications Commission's Notice of Proposed Rule Making in this Docket, released on February 7, 1992 (hereinafter referred to as the "Notice"). In this Notice, the Commission is reallocating 2 GHz spectrum, to create an "emerging technologies" band. The Commission seeks comments regarding the criteria to be applied in determining whether a new service, or expansion of an existing service, merits frequencies from the emerging technologies band. Notice at paragraph 28. SR Telecom will describe herein the emerging subscriber microwave technology it is developing, as well as its views on the criteria that should be applied in determining whether emerging technologies can make use of the spectrum to be reallocated in this proceeding.

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List A B C D E

I. Description of Emerging Technology Developed by SR Telecom.

1. SR Telecom is a leading North American supplier of time division multiple access (TDMA) subscriber microwave radio systems. These TDMA systems are primarily used for the provision of high quality telecommunication services in rural areas, where subscriber densities are relatively low and terrain considerations require multiple transmitter sites to maintain line-of-sight to subscribers. SR Telecom's TDMA microwave products are now used in nearly 70 countries world wide and are providing essential telecommunications services to populations that would otherwise be unserved or unserveable by conventional wire or cable means, or most other radio technologies.

2. Given the large distances and difficult terrain often involved in "rural" areas, frequency bands in the 1.4 to 3 GHz range are required to provide the opportunity to offer such high quality voice and data telecommunication services economically and reliably. The ease of implementation of repeaters with this approach permits the services to be economically carried over hundred of miles, if required - a unique feature in subscriber radio technology. As described in the attached materials, the SR Telecom system features self-contained repeaters that are in weather-proof cabinets, so no transmitter building is required. The antenna

can be mounted on a short pole, and the unit is solar powered so that commercial power does not have to be provided to the repeater site.

3. The digital TDMA methods employed, more fully described in the attached documents, are a rapidly evolving technology which is being adopted by an ever increasing number of telephone companies and other users around the world. The technology provides the operator and subscribers with the highest quality, fully compatible, voice channels, as well as access to high speed (e.g., 64 K bit/second) data channels, full basic access ISDN interfaces and many other enhanced services. Such services cannot be reliably and economically achieved by narrow band radio systems, either analog or digital, now operating in frequency bands below 1 GHz. And virtually all of the frequencies currently allocated for service to rural end users are below 1 GHz. See Rule Section 22.601(b).

4. To date, such SR Telecom TDMA systems and the benefits they can bring to rural subscribers, have not been available to telephone companies or others in the United States due to the lack of a frequency allocation for this purpose, since these radios can only operate in the 1.4 to 3 GHz bands. A rare exception was the granting of waivers several years ago for the use of earlier model TDMA systems in rural Texas and Nevada. See Nevada Bell. 3 FCC Rcd 7217 (CCB and MMB 1988), aff'd. 5 FCC Rcd 5661 (1990); Memorandum

Opinion and Order, FCC 86-204 (Mimeo No. 36640), released April 30, 1986. The subscriber microwave technology is ideally suited for use in the 2 GHz band, as shown by the operations of these authorized systems on frequencies ranging from 1.9 GHz to 2.7 GHz. See Id.

5. TDMA systems of this nature have been recognized by the I.T.U. and are described in new CCIR Recommendations 755 and 756, while frequency plans specifically for TDMA systems in frequency bands between 1.4 and 2.7 GHz are described in CCIR Recommendation 701.

6. Since subscriber services involved would be provided mostly in rural regions - where the 2 GHz band is generally more lightly used - the opportunity exists to reuse the same spectrum that will be used for other services in urban areas, such as personal communications services (PCS). This is of key importance for the efficient use of the radio spectrum.

7. SR Telecom seeks clarification that the frequency band in question in the 2 GHz region will be available for the provision of greatly improved, spectrum efficient, subscriber telecommunication services in rural regions using its TDMA technology and urges the Commission to establish clear procedures for applications to license such use.

II. Criteria to be Used in Awarding Emerging Technologies Spectrum.

8. With regard to use of this spectrum, the Commission states that "we are of the view that, at a minimum, requests for operation of new services in these bands should

demonstrate that the service makes innovative use of a new technology and that the technology is appropriately suited to operate in the 2 GHz region. Similarly, requests for expansion of existing services should demonstrate that the expansion would offer some substantial improvement in either quality of service or spectrum efficiency." Notice at paragraph 28. SR Telecom agrees with this conclusion.

9. In assessing whether spectrum from the newly created emerging technologies band should be made available for a particular technology, the Commission should utilize the following criteria:

A. Does the New Technology Allow the Provision of Existing Services in a More Economical and Efficient Manner?

10. In assessing the usefulness of any radio technology, cost and efficiency concerns must be taken into account. In rural areas, high costs may preclude the provision of any service at all. SR Telecom has developed an efficient, low-cost subscriber microwave system through the use of such features as a small, self-contained repeater that can make do with solar power and its own weather-proof cabinet. In rural areas, the cost of providing commercial power to a remote repeater site, and constructing buildings, access roads, etc. can prove prohibitively expensive.

B. Does the New Technology Combine Existing Services in an Efficient Manner?

11. Radio technologies that combine many existing services are more efficient, because the end users will no longer require multiple radios to accomplish the same objectives. This reduces their costs, which as discussed above, allows more services to a greater number of end users. It also reduces the amount of spectrum used, by eliminating the need for duplicative radios operating in different bands. This helps the Commission to achieve its goal of efficient spectrum use. The SR Telecom systems allow the provision of voice, high speed data, monitoring/alarm, and other enhanced services. These features will allow many rural communities to accomplish all their communications needs with a single system, and the technology could have useful urban applications as well.

C. Is the New Technology Upgradeable?

12. In the past several years, there has been a revolution in radio technology, with new capabilities and enhanced services being developed at a lightening pace. The Commission should therefore consider the upgradeability of a new technology seeking to make use of the emerging technologies band. The SR Telecom system, for example, will provide a high-speed digital path to its end users which will allow the provision of not only existing services, but those that are on the drawing board and which have not yet been

accomplished by simply changing software. By allowing basic computer-to-computer interfacing with a high data rate, the system is designed to extend to its end users virtually any new capability that is developed in the fields of computer and telecommunications technologies.

D. Does the New Radio Allow Reuse of Spectrum That May Otherwise be Lightly Used Once it is Reallocated to the Emerging Technologies Band?

13. The emerging technologies band will obviously be heavily used in urban areas, where the high population density and even terrain will allow the low cost, high revenue provision of PCS and other new services. However, the Commission should consider whether a proposed emerging technology will allow the exploitation of this spectrum in areas where it may otherwise be lightly used, especially in rural regions of the country. The SR Telecom systems are designed to make use of spectrum in the 1.4 to 3 GHz bands in areas where these frequencies are generally not in heavy demand, namely, rural areas. In this regard, SR Telecom urges the Commission refrain from inflexibly "carving up" the emerging technologies band for discrete services, such as PCS. Instead, it should adopt a flexible approach, allowing the sharing of the band by different technologies. This is especially true where other technologies can make use of the channels outside of the heavily populated areas where PCS will be cost effective and in high demand. PCS is based on the use of "microcell technology," which will utilize a grid of

very short range transmitters that can only be cost justified if used in highly populated areas. Outside of urban areas, the cost of establishing a grid of lower power transmitters to serve subscribers that may on average live several miles apart may preclude the use of PCS in the rural setting. Technologies such as that developed by SR Telecom will allow the "reuse" of the full emerging technologies band (including spectrum to be used by PCS systems), without interfering with the use of these channels in urban areas. This will allow the most efficient use of the emerging technologies band.

14. Concerns about interference to PCS and other operations can be alleviated by the frequency coordination process which has long been used for 2 GHz microwave. And concerns that rural technology such as the SR Telecom systems will exhaust spectrum needed for PCS use can be allayed by establishing safeguards designed to preserve adequate spectrum for PCS systems where they are needed. These protections could include a "buffer zone", i.e., a designated geographic separation from the nearest urban area (or from the nearest PCS system). Moreover, in rural areas, the communications needs will often occupy only a small portion of the spectrum to be made available in the emerging technologies band, leaving sufficient spectrum for any PCS systems or other technologies that may eventually be utilized near a rural community in the future.

E. Does the New Technology Imporve the Quality of Life in the Area to Be Served?

15. Emerging technologies such as the SR Telecom systems will extend high speed data capability to remote areas, allowing the public to work from their homes more effeciently, and to provide businesses and services previously unavailable in rural America.

CONCLUSION

16. SR Telecom requests the Commission to adopt the above criteria for evaluating the prospective use of the emerging technologies band by new technologies and/or services. SR Telecom also urges the Commission to use a flexible channel assignment approach, so that spectrum set aside for, e.g., PCS, does not lie fallow in many portions of the country where other services are urgently needed.

Respectfully submitted,

SR TELECOM, INC.

By: _____
Jack Zavitz
Senior Vice President

Dated: June 5, 1992

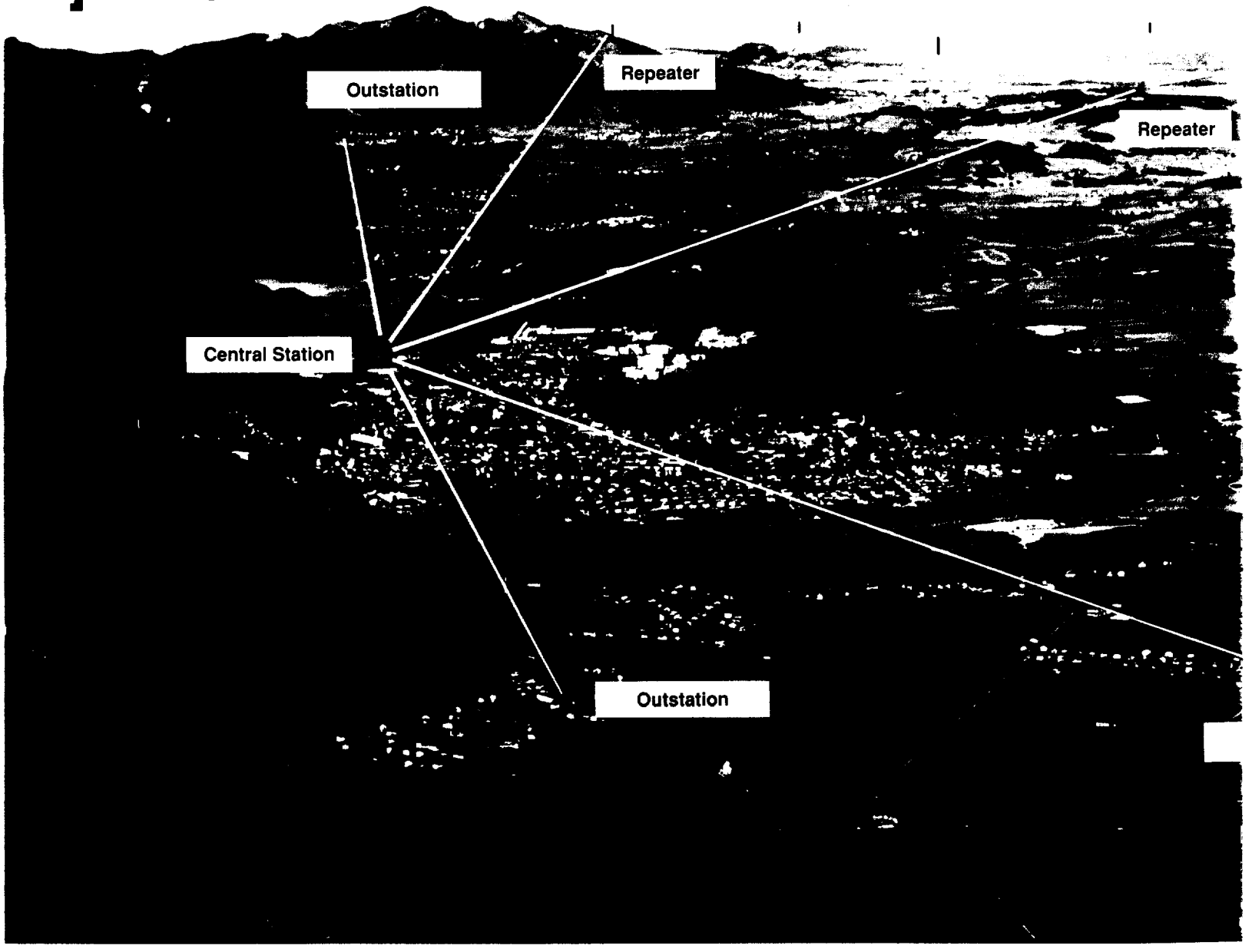
SR Telecom

World leader in TDMA
point-to-multipoint
subscriber radio

quickly extends telephone and data services

economic alternative to cable

easy to install, modify, and maintain



An SR Telecom system distributes telephone and data services.

Hundreds of scattered subscribers enjoy modern telephone services using a central station and multiple outstations.

The central station connects to the telephone exchange and distributes telephone services to the region.

Outstations act as local distribution points for conventional wire lines.

The outstations connect to the central station using TDMA point-to-multipoint radio, in bands from 1.4 to 2.7 GHz.

The range of the central station extends to some forty kilometers. Repeaters can increase range to several hundred kilometers.

Outstation

SR Telecom around the world

People in over 60 countries depend on SR Telecom systems for telecommunications.

The first systems, installed in rural Canadian areas during 1977, continue to operate reliably in their original or expanded configurations.

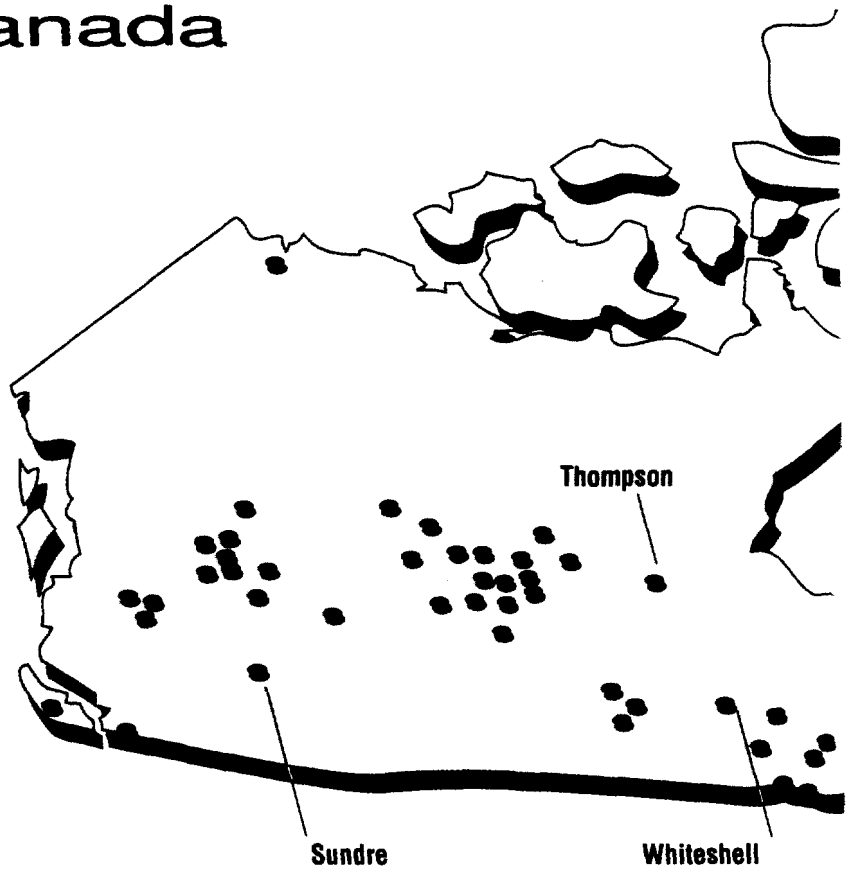
SR Telecom originated the subscriber radio concept and, working with several Canadian telephone companies, developed the equipment reliability that assured its position as world leader.

Continuous technological upgrading has transformed the product since its original design.

Today, nearly 1,000 SR Telecom systems distribute over 45,000 lines in more than 60 countries, providing modern telephone and data distribution services to people outside urban centers.

SR Telecom in Canada

CANADA



Across Canada, SR Telecom systems distribute over 6,000 telephone lines and data circuits to homes and businesses outside the cabled network.

In 1977, the telephone authority in the province of Newfoundland installed the first SR100 system in the village of Petites.

Today, the expanded system continues to operate reliably.

In Canada alone, over 140 SR Telecom systems operate in the networks of the 15 major telephone operating companies.

SCADA and Telephones

In Alberta, a major oil company required telephone and SCADA services to monitor, control, and maintain its scattered gas field operations in the foothills of the Rocky Mountains.

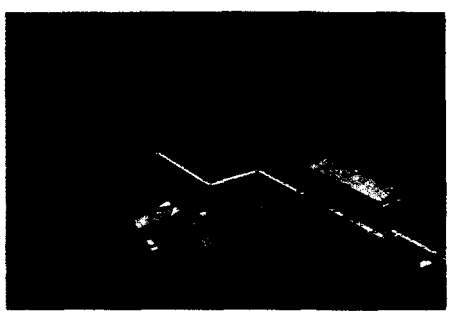
After a study of the telecommunications requirements in the rugged territory, the SR500 was chosen.

The SR500 connects to the public telephone network at Sundre, where the SR500 central station is located. Five repeaters connect outstations located at the gas field office and various remote sites.

The SCADA controller is located in the field office. It monitors and controls the gas line heaters, compressors and the gas plant. At these sites, 19.2 kbps interfaces facilitate synchronous communications with the SCADA controller.

In addition, the field office is connected to the Calgary head office using two 9.6 kbps data interfaces, the SR500 system, and leased lines in the public telephone network.

Each site enjoys telephone services distributed by the SR500 system from one or other of two PABX installations, located in the field office and in the gas plant. Four-wire dedicated lines in the SR500 and public telephone networks connect each PABX to the head office in Calgary.



Panther: Antennas on mast link repeater in building with Field Office and Blue Hill

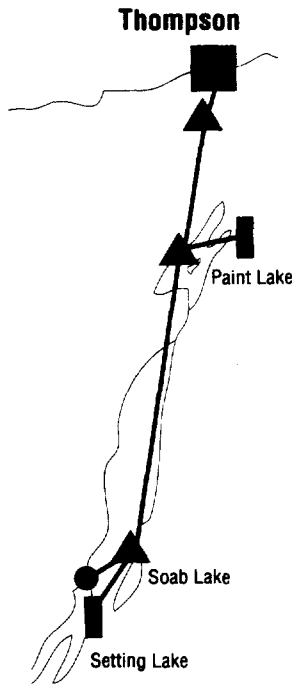
SR500 outstation installation near Thompson, Manitoba

Telephones for remote populations

In 1978, the telephone administration in the province of Manitoba installed its first SR100 system as a short-term solution, to defer, for some years, the necessity of installing new cable plant in the Whiteshell area.

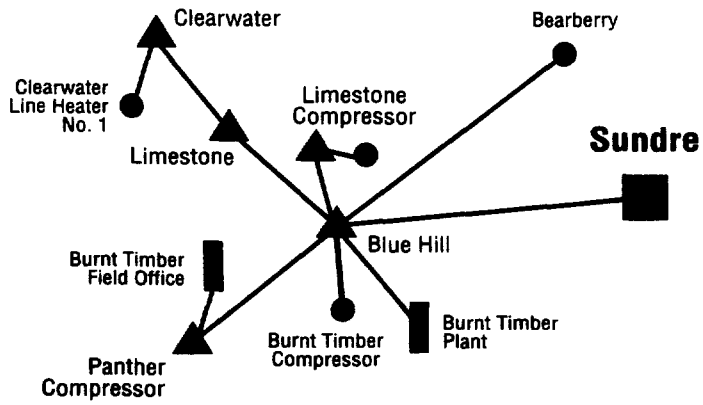
In 1989, by contrast, the administration chose the SR500 as the long-term solution to serve communities around Thompson. That system distributes over 170 lines to many isolated areas up to 80 km distant.

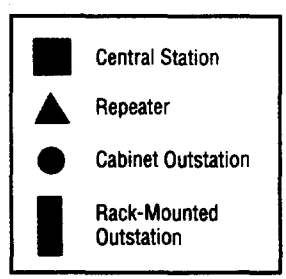
In all, 12 SR Telecom systems form part of the network in Manitoba.



SR500 in the Thompson area

SR500 in the Sundre area

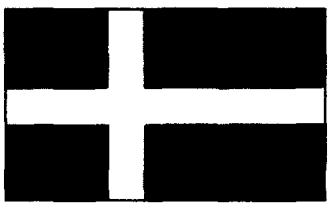




SR Telecom in Sweden

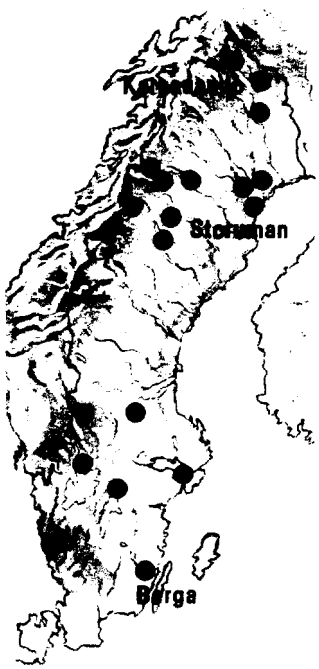
SVERIGE

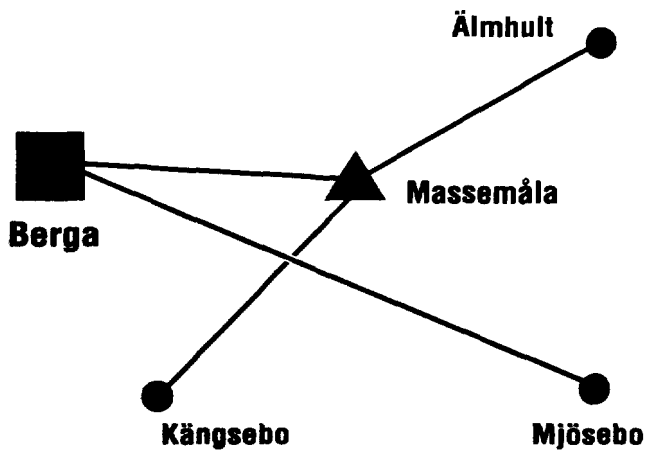
Rural Upgrading



In 1982, Swedish Telecom addressed the problem of providing telephone service to sparsely populated remote areas by installing an SR100 system at Karesuando, in northern Sweden.

Now, over 20 similar systems – both SR100 and SR500 – distribute telephone services, eliminating the expensive and time consuming maintenance of aging aerial plant and small rural exchanges.





An SR500 system distributes 2-wire, 4-wire, and data transmission services to 4 population centers around the Berga exchange.

SR500 in the Berga area

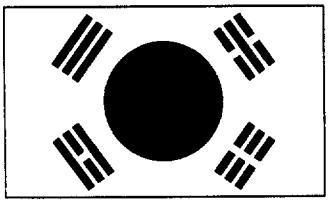
This SR500 outstation ensures reliable service despite harsh winter conditions in the Storuman region.

Horn antenna's view over frozen lake towards Storuman where the SR500 central station interfaces with an AXE exchange.

SR Telecom in Korea

한국

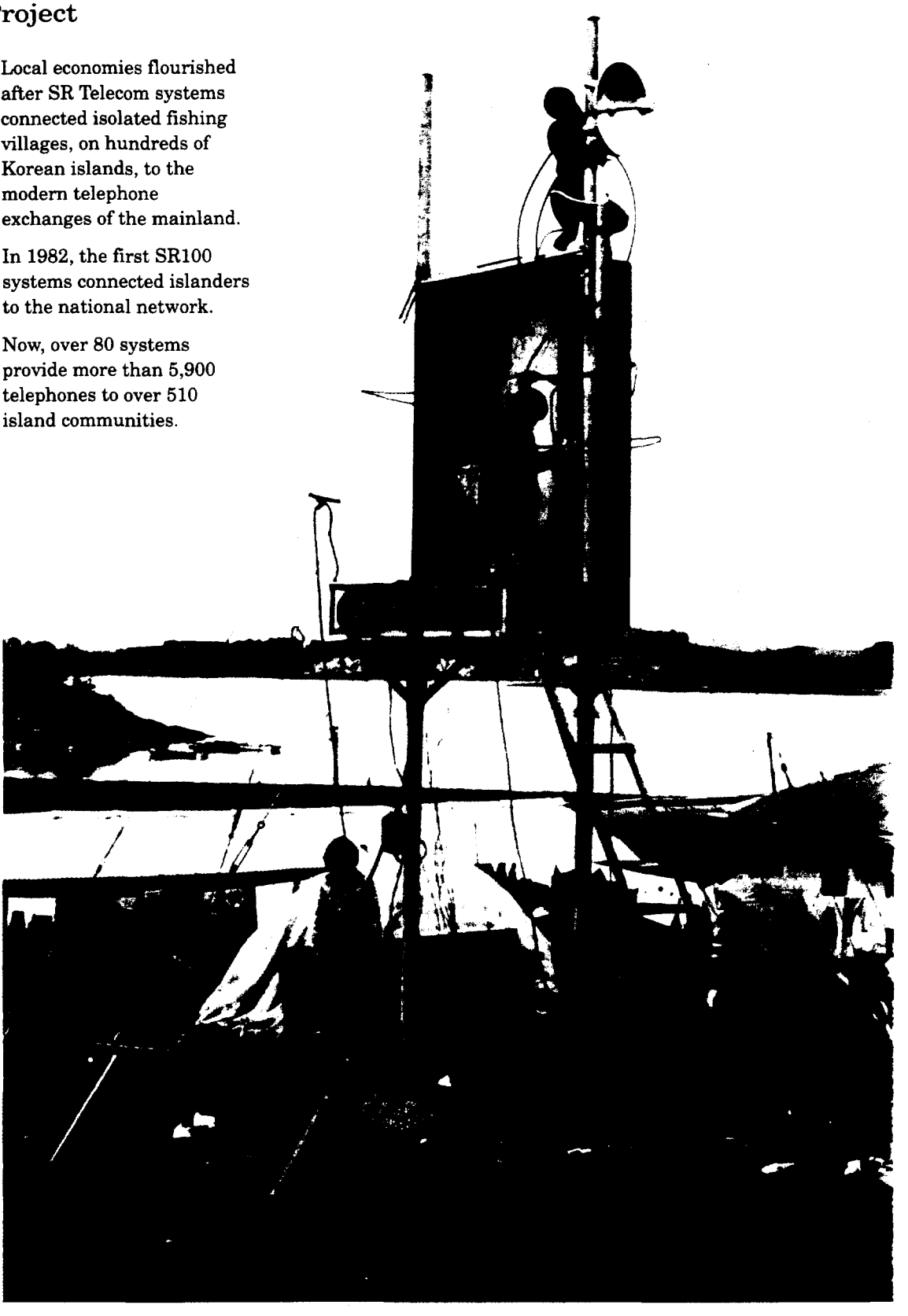
The Korean Island Project



Local economies flourished after SR Telecom systems connected isolated fishing villages, on hundreds of Korean islands, to the modern telephone exchanges of the mainland.

In 1982, the first SR100 systems connected islanders to the national network.

Now, over 80 systems provide more than 5,900 telephones to over 510 island communities.

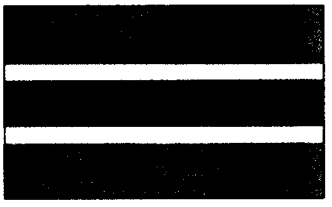


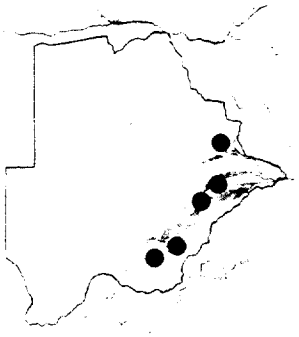
Installation of 18 lines on Dali island. One technician checks performance while the other orients the antenna towards the central station located on the mainland.

SR Telecom in Botswana

SETSWANA

Rural Expansion

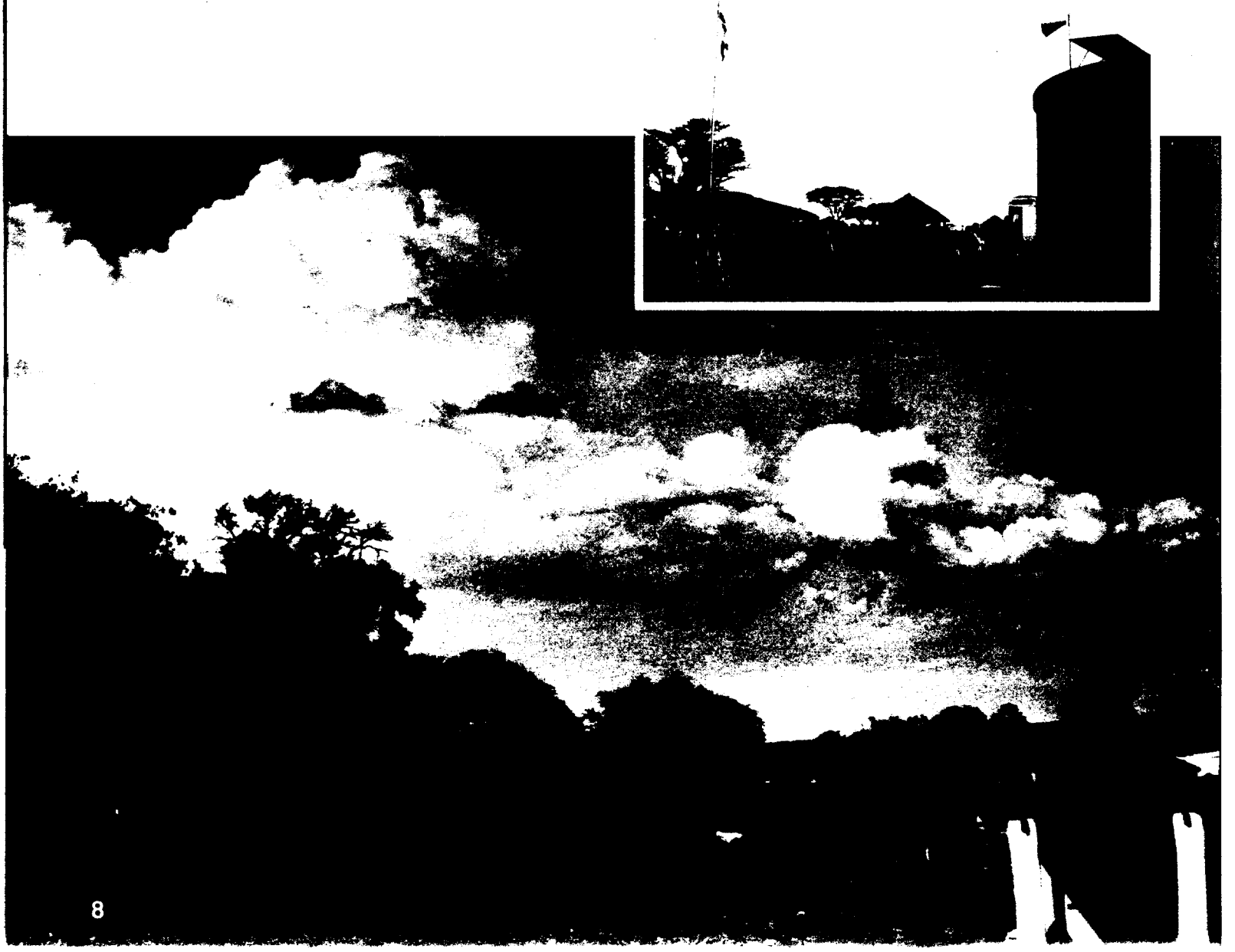




After completing urban area modernization, the Botswana Telecommunications Authority enhanced and expanded rural services with new switching, solar-powering, and transmission equipment.

SR100 systems now connect private and public telephones to the national network, and distribute trunks to small electronic rural exchanges in larger centers.

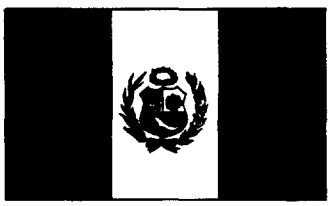
An outstation serves this village in the Francistown region.



SR Telecom in Peru

PERÚ

Rural and Urban Expansion

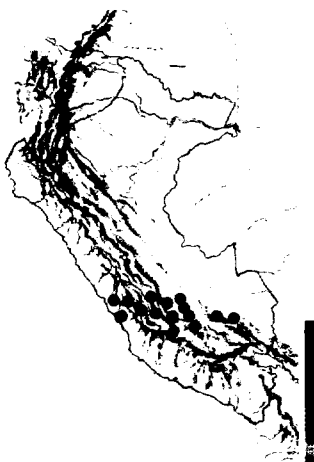


Both rural and urban areas of Peru enjoy modern telephone services distributed by SR Telecom subscriber radio systems.

In 80 rural towns high in the Andes of Southern Peru, SR Telecom systems ensure the distribution of basic telephone services.

In the greater Lima area, 25 systems link over 600 public telephones, in high growth suburbs, to the national network.

Lima: one person can easily install an outstation.



about subscriber radio

An alternative to telephone cable, subscriber radio connects remote subscribers to a telephone exchange.

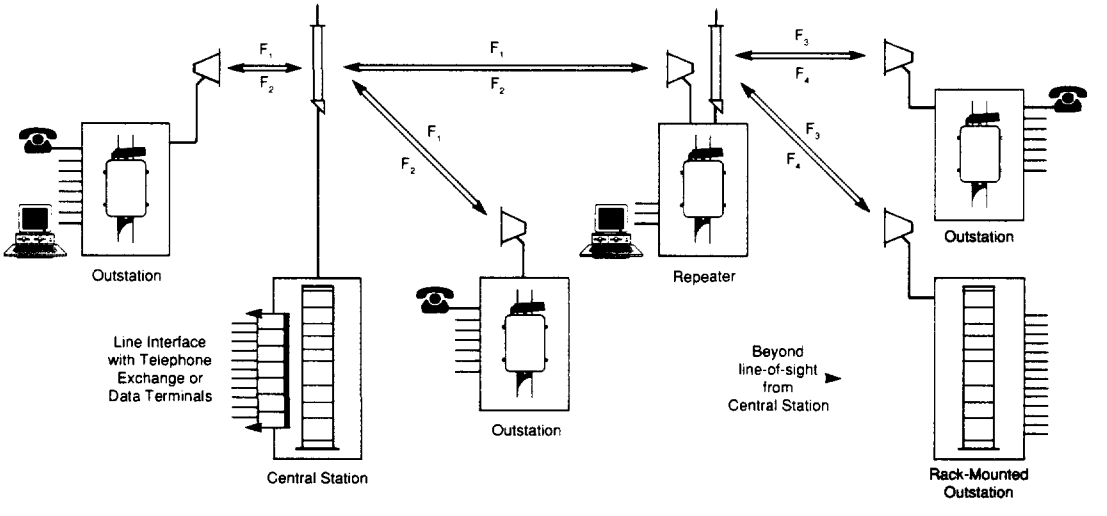
Like cable, the central station connects to the main distribution frame of the telephone exchange on a two-wire basis. Similarly, at the other end, subscribers' telephones connect to remote stations using conventional cable and dropwire.

The central station transmits continuously to all remote stations within line-of-sight using one radio frequency (F1).

When a remote station has a requirement to transmit information back to the central station, it uses a second radio frequency (F2). This second frequency is shared by all remote stations, which transmit in synchronized bursts using TDM-DAMA techniques.

Repeaters extend the range of the system, and use other pairs of radio frequencies in the outbound direction.

In addition to 2-wire subscriber lines, the system accommodates a full range of telephone and data interface systems, some of which are shown in the table below.

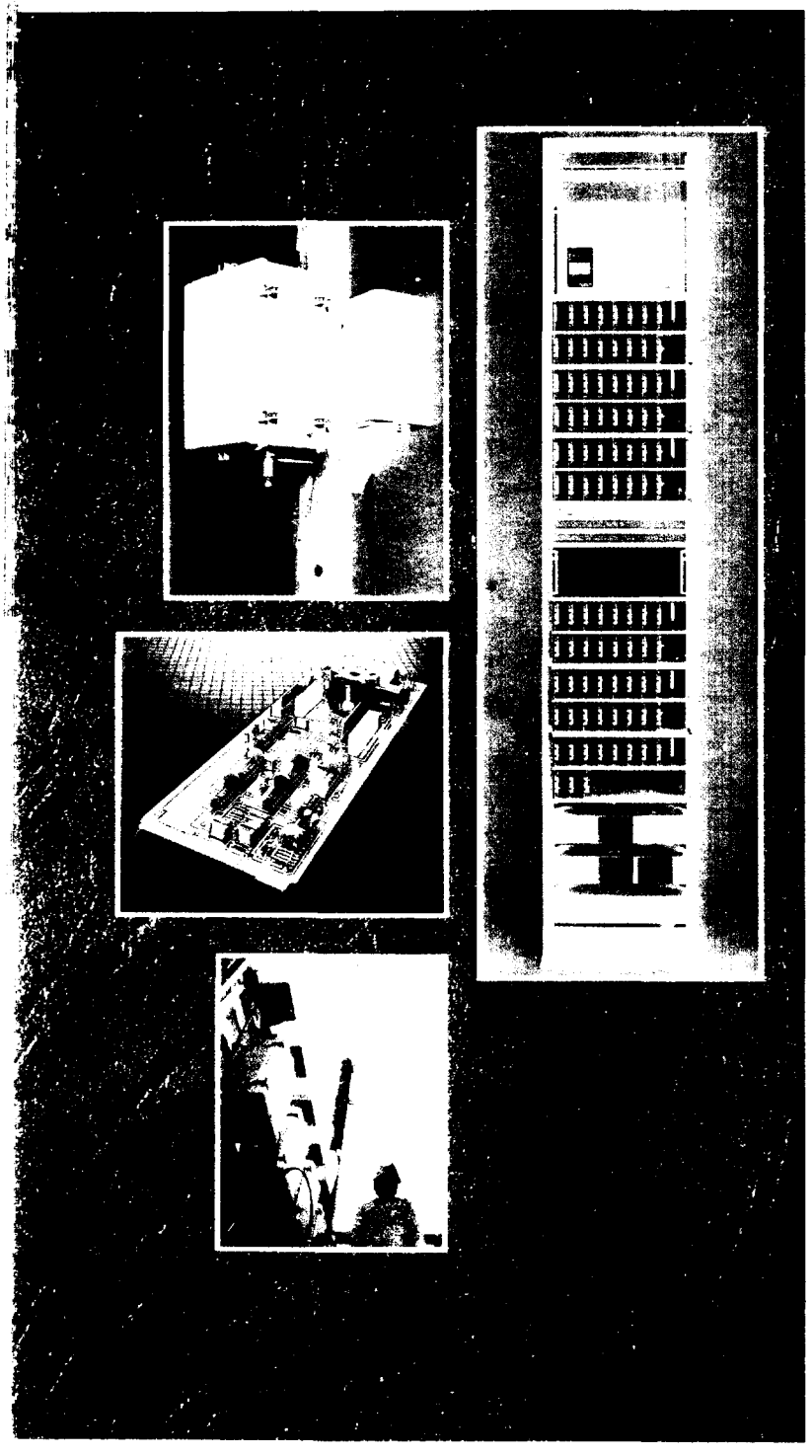


Summary of systems		SR100	SR500
Trunks		15	60
Capacity	line addresses	94	4095
	lines/outstation	1, 6 and 48	16 and 256
Frequency bands		1.4 to 2.7 GHz	1.4 to 2.7 GHz
Subscriber interfaces		2 and 4-wire	2 and 4-wire
		payphones	payphones
		data (25 - 4800^{+} bps)	data (1.2 - 64 kbps)

SR100 System

For low subscriber densities, the SR100 system distributes up to 94 lines which share 15 TDMA trunks. Calls between two subscribers connected to the same outstation do not require trunks: they are connected by Intracall, a local switching option.

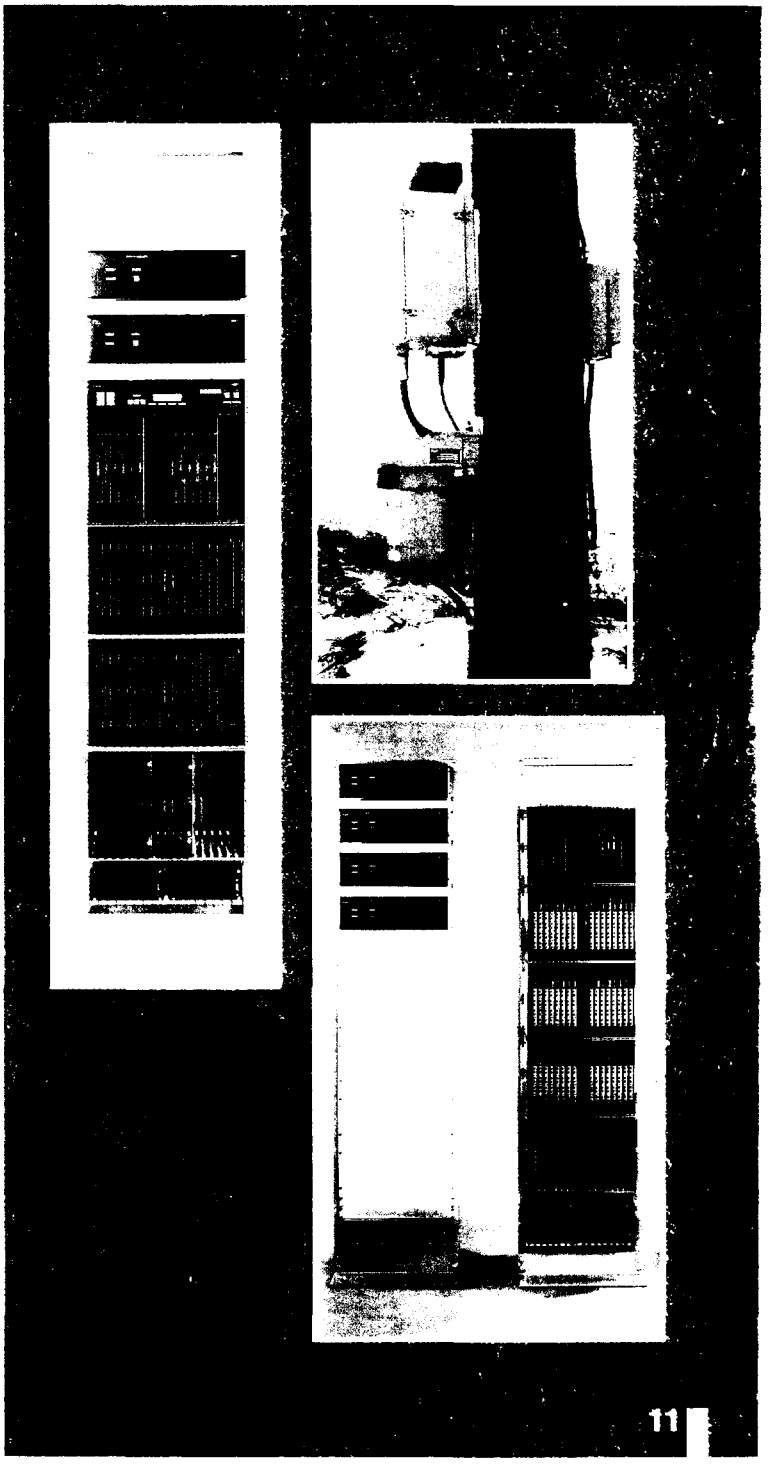
Weatherproof remote stations mount outdoors and can be solar-powered.



SR500 System

For higher subscriber densities, the SR500 system provides distribution to 500 or more lines using 60 TDMA trunks.

Besides Intracall, the SR500 provides advanced remote testing and interface options required in the most sophisticated telephone, data transmission and industrial networks.



SR Telecom

SR500

The SR500 System

TDM-DAMA
(Time Division Multiplex - Demand Assigned Multiple Access)

Point-to-Multipoint, 60-channel, digital Subscriber Radio in bands from 1.4 to 2.7 GHz

Distributes telephone and data services to subscribers.

Typical system capacity exceeds 1,000 lines (depending on individual line usage).

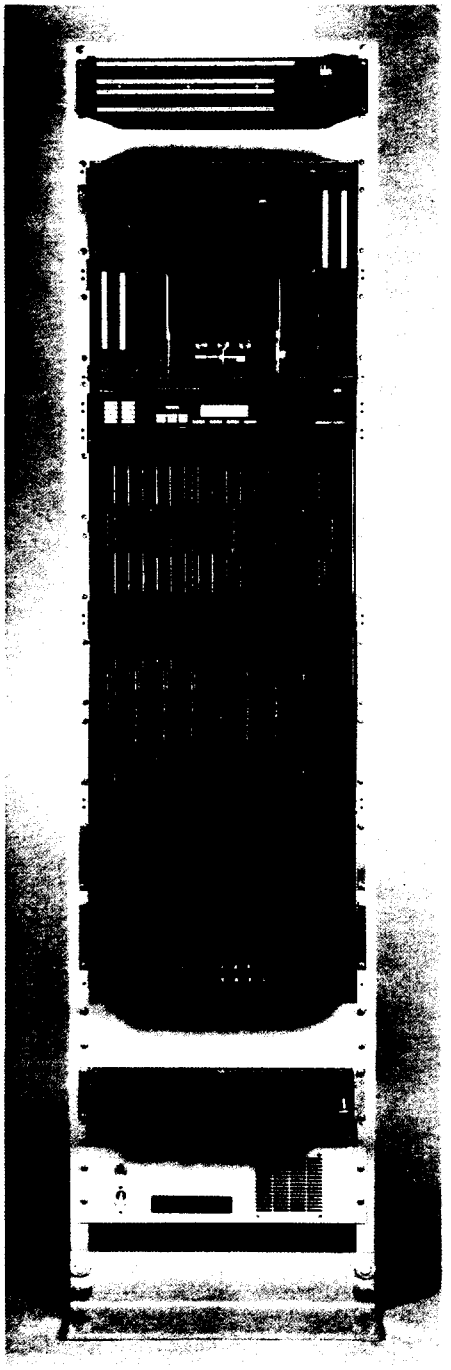
60, 64 kbps trunks can be used in either demand access mode or dedicated mode. Maximum number of remote stations: 511. Maximum number of line addresses (voice and data): 4095.

In telephone applications, the system provides "transparent" transmission of 2-wire, 4-wire, payphone, facsimile and telex services.

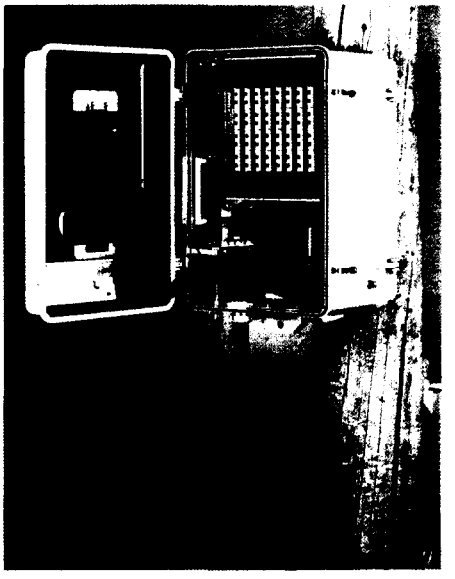
In data applications, the system provides multipoint distribution of data circuits, both synchronous and asynchronous, at rates from 1.2 kbps to 64 kbps.

Cabinet outstation equipment is designed for outdoor installation over a full range of climatic conditions.

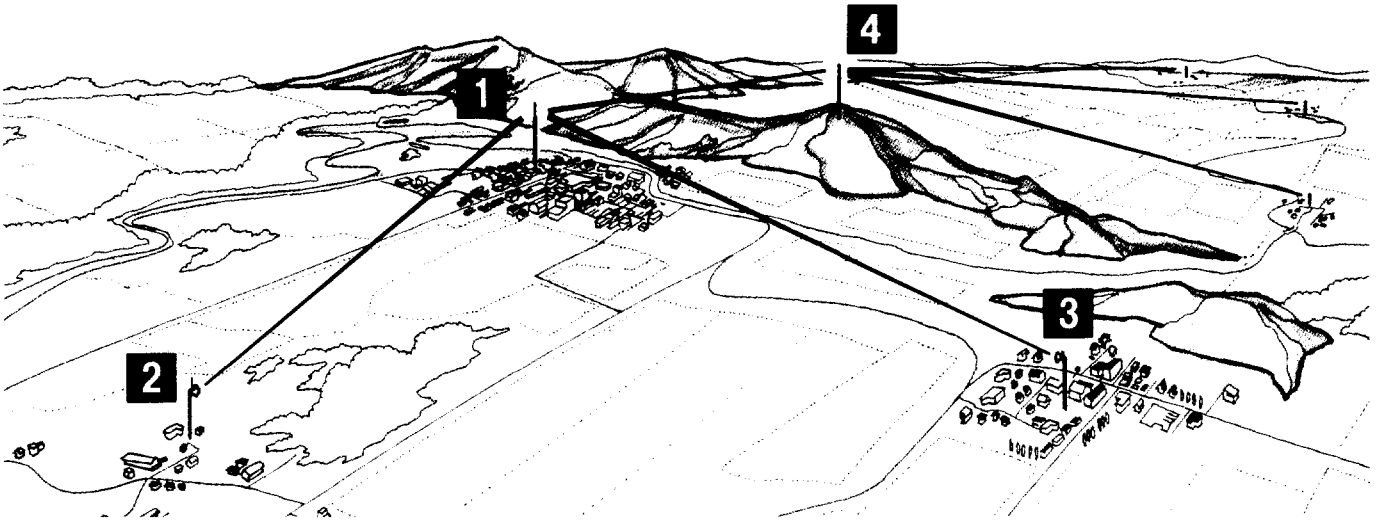
Rack-mounted outstation and repeater equipment is available for locations requiring greater capacity.



SR500 central station installed in a standard 19" wide rack and equipped with a protected transceiver, controller, power supply, and 2 line shelves



Weatherproof cabinet outstation equipped with 32 2-wire subscriber lines

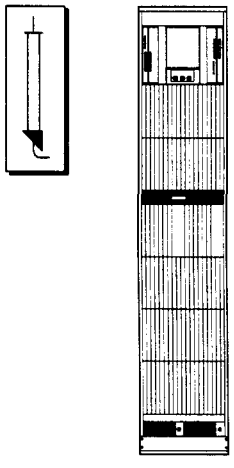


General

The subscriber radio system distributes telephone lines and data circuits from a base Central Station to multiple remote stations in the surrounding region.

The SR500™ uses Time Division Multiple Access (TDMA) techniques and point-to-multipoint digital microwave radio in bands from 1.4 to 2.7 GHz. Spectrally efficient, the SR500 requires only a single pair of frequencies for each network node, namely the Central Station and any Repeaters (if used). Up to 511 remote stations are possible with a cumulative link range of 720 km (450 miles) from the central station.

Subscribers connected by the SR500 system have access to 60 full duplex, 64 kbps trunks. Telephone, data, facsimile and telex services may all be distributed to meet requirements at remote sites.



1 CENTRAL STATION

Capacity (one-rack assembly)

Analog interface:
640 2-wire lines, or 160 4-wire lines, or 160 payphone lines.

Digital interface:
2 Mbps as per CCITT Recommendations G.703, G.704, G.706, G.823 for connection with digital exchanges; signaling adaptable to various digital exchanges.

Data:
160 data circuits

Power

Input voltage: -48 VDC

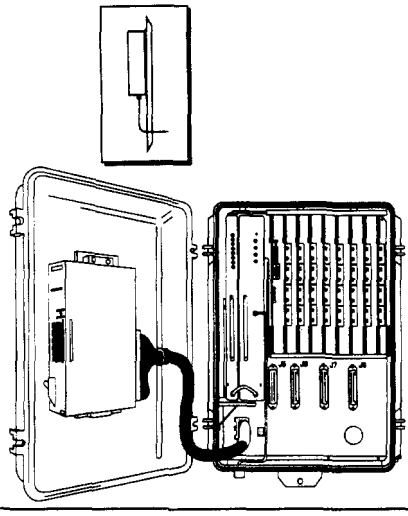
Requirement:
Analog : 80 W (typical[1])
Digital : 60 W (typical[1])

Operating temperature

-10° to +55° C

Standby transceiver, controller, and power supplies are options.

[1] *Power requirements stated are based on typical residential traffic loading assuming fully equipped cabinet stations and half capacity on central and rack-mounted stations with 30 dBm transceivers. Actual power requirement depends upon traffic load, as well as the equipment options selected for primary power voltage, service lines, and standby equipment.*



2 CABINET OUTSTATION (weatherproof)

Capacity

32 2-wire lines, or 16 4-wire lines, or 8 payphone lines, or 8 data circuits (or mixed services). With an auxiliary cabinet outstation, the capacity is doubled.

Power

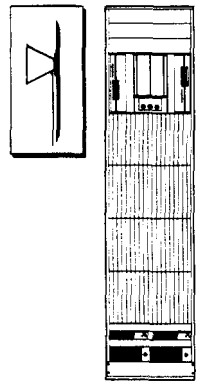
Input Voltage: +13.6 VDC
-48 VDC (optional)
120/240 VAC, 50/60 Hz (optional)

Requirement: 40 W (typical[1])

Operating temperature

-30° to +55° C
-40° to +55° C (low-temperature option)

Plug-in line modules are common to all remote stations. A power & junction pack (PJP) is available for cabinet stations with Krone™ terminal blocks and a 35 Ah battery. With the multiple battery option, the capacity is doubled.



3 RACK-MOUNTED OUTSTATION

Capacity

256 2-wire lines, or 128 4-wire lines, or 64 payphone lines, or 64 data circuits (or mixed services)

Power

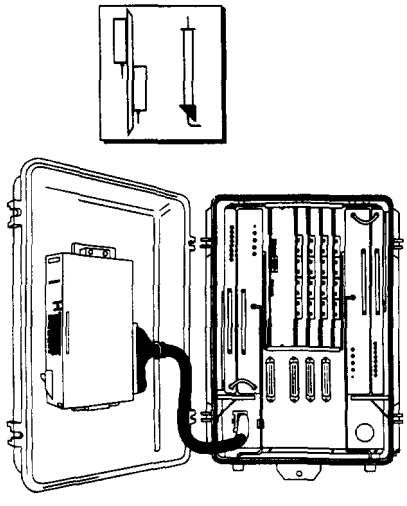
Input voltage: -48 VDC

Requirement: 60 W (typical[1])

Operating temperature

-10° to +55° C

Standby transceiver, controller and power supplies are optionally available. Hot- or cold-standby transceivers are available.



4 REPEATERS

CABINET REPEATER (weatherproof)

Capacity

16 2-wire lines, or 8 4-wire lines, or 4 payphone lines, or 4 data circuits (or mixed services). With an auxiliary cabinet, up to 32 additional 2-wire or 16 4-wire lines, or 8 payphone lines, or 8 data circuits can be added.

Power

Input voltage: +13.6 VDC
48 VDC (optional)
120/240 VAC, 50/60 Hz (optional)

Requirement: 70 W (typical[1])

Operating temperature

-30° to +55° C
-40° to +55° C (low-temperature option)

RACK-MOUNTED REPEATER

For higher capacity, a rack-mounted repeater, similar to the rack-mounted outstation, is available for indoor installation.

Hot and cold standby repeaters are optionally available.

System Characteristics

CONFIGURATIONS

SR500 systems can be configured in star, branched, or linear networks, as determined by the local density of subscribers and topography of the service area.

CAPACITY

The system architecture provides 60, 64 kbps trunks and an addressing capacity of over 4,000 lines. All lines have access to all trunks.

In any particular application, the system line capacity is a function of the traffic generated by the connected subscribers and the grade of service objective for the area. The single group of 60 trunks provides a two-way traffic capacity in excess of 47 Erlangs (1700 CCS) for a 1% grade of service. For subscriber lines generating an average traffic of 0.07E (2.5 CCS), 670 subscribers could be served, assuming that all traffic is directed outside of the system (i.e., requiring one trunk per call).

For data applications, several low-speed data channels, at different remote stations, can share the use of one or more of the 60, 64 kbps trunks.

Intracall

For calls between subscribers connected to the same remote station, the Intracall option reduces the traffic load on SR500 trunks.

Internal Signaling Trunks

The Intracall option provides the SR500 with internal signaling trunks that are used for system management and operation. This capability allows calls within the same remote station to be completed without using any of the 60 traffic carrying trunks. At a remote station, local calls can be completed even if the link between the remote station and the central station is out-of-service.

SUBSCRIBER VOICE SERVICES

Using appropriate modules, the SR500 supports

- 2-wire individual, two-party or multiparty lines
- 2-wire payphones:
  - semi-postpay
  - prepay for 50 Hz, 12 kHz, and 16 kHz metering pulses
  - Centurion™ prepay (North America)
- 4-wire, E&M signaling

SUBSCRIBER DATA SERVICES

- asynchronous data, 1.2 - 19.2 kbps
- synchronous data, 2.4 - 64 kbps with the capability of remotely programming the data rate
- 64 kbps co- and contradirectional as per CCITT Rec. G.703 with, or without, E&M signaling

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Transceiver Characteristics

RF input and output impedance
50 Ω, unbalanced

Frequencies
A minimum channel spacing of 3.5 MHz is required in accordance with CCIR reports 380, 1057 and 701.

Operating Bands MHz	TxRx Channel Separation, MHz
1427 - 1535	40, 49, or 65.5
1700 - 1900	108.5
1900 - 2100	101.5
2100 - 2300	105
2300 - 2500	94 or 101.5
2500 - 2690	119

Transmitter RF output power
(at antenna port)
30 or 35 dBm, guaranteed[3]: 1.4 - 1.5 GHz
30 dBm, guaranteed[3]: other bands

Modulation
Modified OQPSK

Frequency stability

	Stability in ppm	
	1427 - 1535 MHz	1700 - 2690 MHz
From CS	10	2.5
To CS	2.5	2.5

Detection
Coherent

Receiver sensitivity at antenna port
(for BER of 1×10^{-4})
-87 dBm guaranteed[3]

Receiver operating range
-45 to -90 dBm

[3] *"Guaranteed" performance characteristics are those which are met by all equipment operating anywhere within the applicable temperature range.*